



THE UNIVERSITY OF
CHICAGO

Computational and Applied Mathematics
&
Statistics Student Seminar

Jiaheng Chen

Computational and Applied Mathematics
University of Chicago

Learning Pseudo-Differential Operators

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12:00 PM

Rosenwald 011

1115 E 58th St

ABSTRACT

Pseudo-differential operators (PDOs) are a broad and fundamental class of operators in analysis and partial differential equations, with wide-ranging applications in mathematical and computational sciences. In this talk, I will present our recent work on learning elliptic PDOs from noisy data. Within a wavelet–Galerkin framework, we formulate this task as a structured infinite-dimensional regression problem with multiscale sparsity. Building on this structure, we propose a sparse, data- and computation-efficient estimator that leverages a novel matrix compression scheme tailored to the learning task and a nested-support strategy to balance approximation and estimation errors. In addition to establishing convergence rates for the estimator, we show that the learned operator induces an efficient and stable Galerkin solver whose numerical error matches its statistical accuracy. Our results therefore contribute to bringing together operator learning, data-driven solvers, and wavelet methods in scientific computing.